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(54) **Sintered self lubricating bearings**

(57) A sintered body 2 for a self lubricating bearing has at least a portion 5 bounded by an area of its inner peripheral surface with a permeability less than that of the remainder. The number of portions of reduced permeability is between once and twice the numerical value of the diameter of the inner peripheral surface expressed in millimeters. The portions 5 reduce the amount of oil in the bearing which penetrates the sintered body, thus preventing the break up of the oil film which supports the shaft 1.

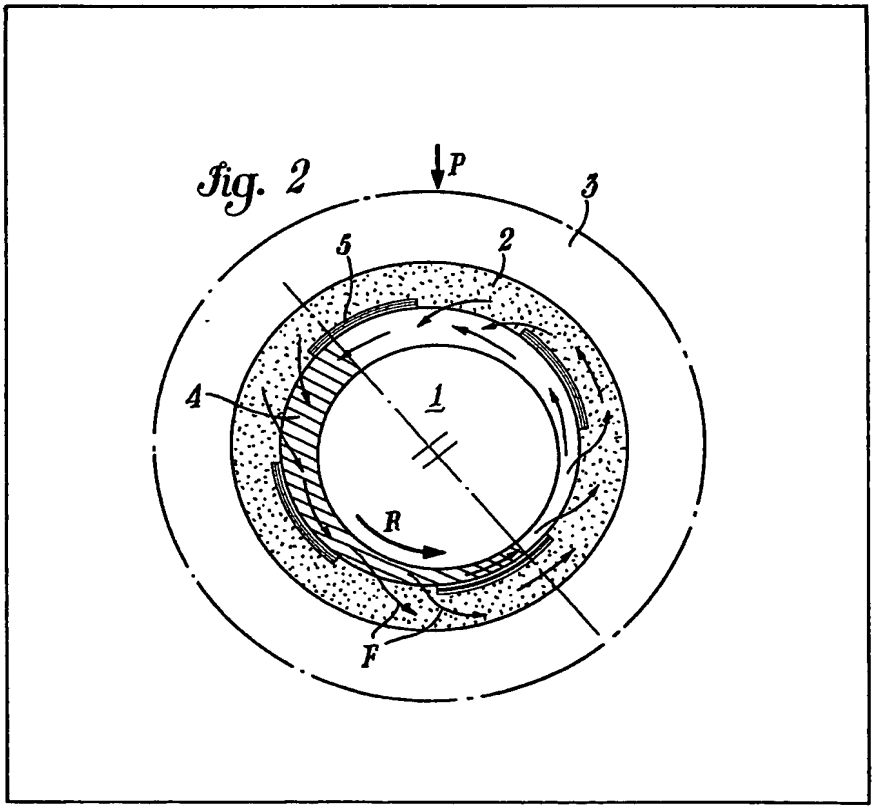

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Fig. 1

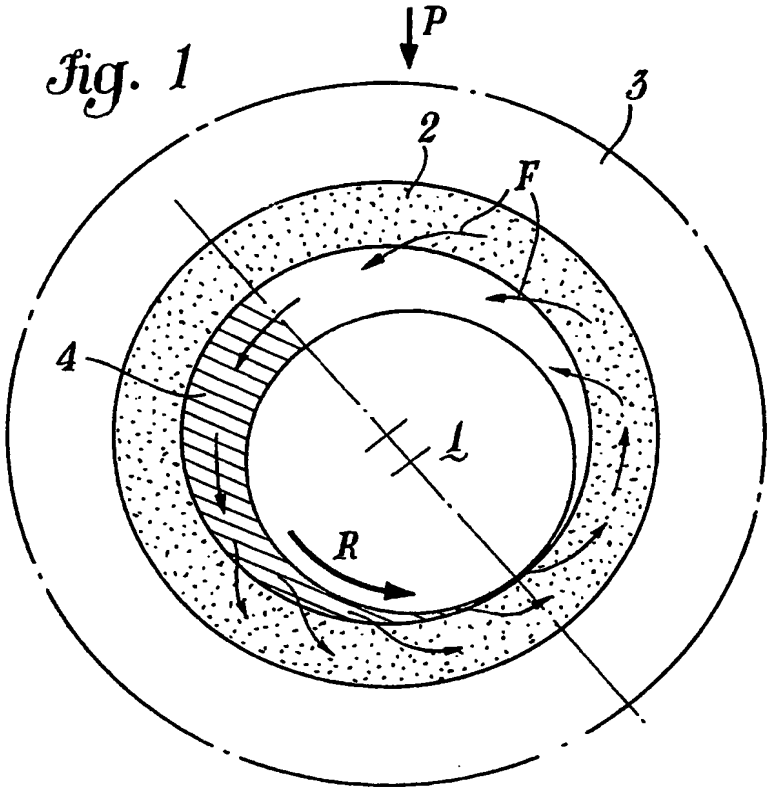
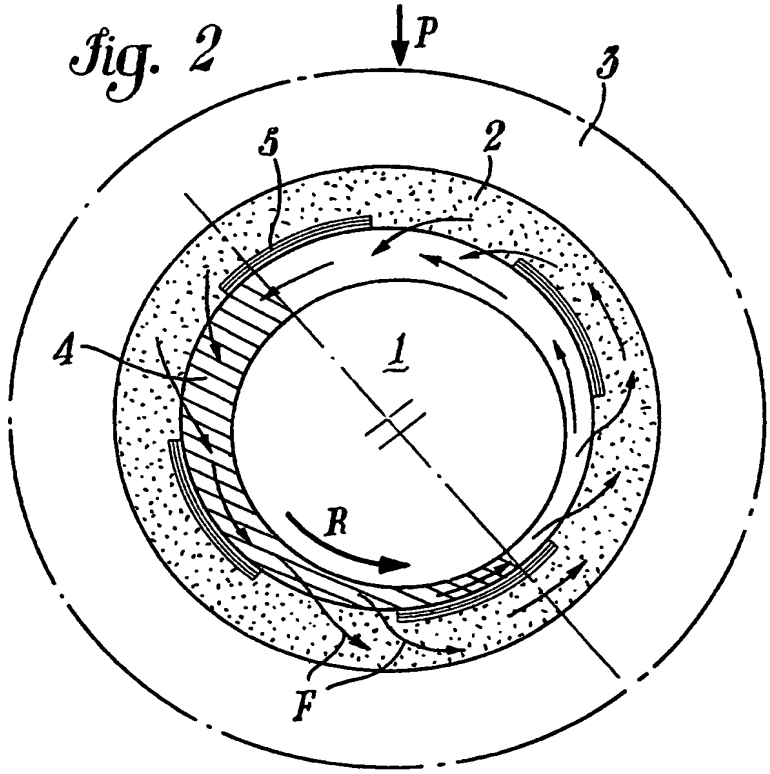


Fig. 2



SPECIFICATION

Improvement in sintered self lubricating bearings

The present invention relates to sintered self lubricating bearings.

The conventional method of dimensioning sintered self lubricating bearings is based upon the maximum admissible value of the numerical product *p.v.*, wherein *p* is the acting pressure per unit area, as defined by the ration between the load and the area of the inner bearing surface of the bush (inner diameter x axial length), and *v* is the peripheral velocity of the shaft.

The existence of a maximum value of the product *p.v.* is a direct consequence of the existence of a surface porosity, in the inner wall of the bearings, which does not allow the build-up of a continuous film of lubricant in many cases wherein the average pressures exceed determined limit values. In cases of this kind, the lubricant interposed between the bush and the shaft is pushed towards the bush and tends to flow into the pores and therefore is "lost" for the purpose of its load-bearing capacity.

On the other hand, porosity of the bearings is an essential functional characteristic because it allows both soakage "for life", and the circulation of oil through the walls according to the direction imposed by the pressure differences which are established when functioning.

The object of the present invention is to provide sintered body for a self lubricating bearing which enables the bearing to be operated under load conditions much heavier than those of the conventional sintered self-lubricating bearings.

According to the present invention a sintered body for self-lubricating bearing comprises at least a portion, bounded by an area of the inner peripheral surface, having a permeability less than that of the remainder of the bearing body.

An embodiment in accordance with the present invention is hereinafter particularly described with reference to the accompanying drawings, which show an illustrative but not limitative preferred embodiment.

In the drawings:

Fig. 1 shows schematically a conventional sintered body for a bearing, viewed in section on a plane normal to the axis;

Fig. 2 is a view similar to that of Fig. 1, showing a bearing body according to the present invention.

With reference to Fig. 1, numeral 1 indicates a shaft rotating in the direction indicated by arrow *R*, reference 2 denotes a sintered bush inserted in a seating 3; *P* indicates the direction of action of a load, and oil flow is indicated by arrows *F*. A zone 4, shown as a hatched area, is where the oil sucked in by the bush 2, progressively as the pressure increases, is again introduced into the porous surface portion of the bush, so that in the area of maximum pressure, the lubricant film interposed between shaft 1 and bush 2 is lacking.

According to the present invention (Fig. 2) there are established a number of portions of reduced permeability, indicated by reference 5, symmetrically distributed on the inner surface of the bush 2. The portions 5 are provided with the intention of preventing the oil penetrating into the porous mass, thus allowing the formation of a continuous film of lubricant, where shaft 1 floats.

The number of such portions 5 may vary from 1 to 2 times the numerical value of the diameter of the inner peripheral bearing surface expressed in mm; according to the characteristics, as a whole, of the shaft-bearing assembly, such as:

- the shaft diameter;
- the constancy or not of the load position;
- the constancy or not of the rotation direction;
- the constancy or not of the peripheral velocity;
- the possibility of assembling the bearing in the seating with a fixed positioning with respect to the plane of action of the load;
- the wall thickness of the bearing.

The ratio between the reduced local permeability and the normal local permeability may vary from 0.05 to 0.95.

The definition of the number of portions of reduced permeability and of the ratio between the local permeabilities is tied to examination of the functional parameters; however, it is always possible to obtain admissible values of the product *p.v.* which are greater by up to at least 3 times the value suggested by the national and international specifications currently existing.

The sintered materials which lend themselves to the production of bearings of the present invention, are:

- iron and its alloys;
- steel of any formation, including stainless steels;
- copper alloys;
- aluminium, zinc and their respective alloys.

The method of manufacture does not differ substantially from that usually adopted in powder metallurgy, and comprises the following phases:

- pressing, with a suitably shaped core, in such a way as to form an inner profile of the bearing in steps of a predetermined difference in height comprised between 0.01 mm and 2 mm, depending on the geometrical characteristics of the bearing and on the anticipated operational conditions;
- sintering, under conditions defined by the type of material chosen;
- sizing in a mold with annular and circular shaped elements;
- soaking in lubricating oil having characteristics selected with respect to the functional and constructional specifications of the bearing.

The soaking operation can be effected before sizing.

The dimensional precision obtainable is high, and such as to guarantee the fulfilment of tolerance classes ISO 5, or ISO 6, or ISO 7, or ISO 8, according to needs, on all diametral dimensions.

The present invention has been specifically described in relation to a preferred embodiment thereof, but variations may be made therein within the scope of the appended claims.

CLAIMS

1. A sintered body for a self lubricating bearing comprising at least a portion bounded by an area of

inner peripheral surface having a permeability less than that of the remainder of the bearing body.

2. A sintered body for a self lubricating bearing, as claimed in claim 1, having a portion of reduced permeability disposed such that its area of the inner peripheral surface substantially corresponds with the zone of maximum pressure of lubricant when the bearing is operative under load.

3. A sintered body for a self lubricating bearing, as claimed in either of claims 1 and 2, wherein a plurality of portions of reduced permeability are disposed such that their respective areas of the inner peripheral surface are equally angularly spaced about the axis thereof.

4. A sintered body for a self lubricating bearing, as claimed in claim 3, wherein the angular extent of each area is the same.

5. A sintered body for a self lubricating bearing, as claimed in any one of claims 1 to 4, where in the portion of reduced permeability is of less radial thickness than the remainder of the body.

6. A bearing body, according to any one of claims 1 to 5, wherein the number of portions of reduced permeability lies within the range one to two times the numerical value of the diameter of said inner peripheral surface expressed in millimeters.

7. A bearing body, according to any one of claims 1 to 6, wherein the ratio between the permeability of said portions and the permeability of the remainder of the sintered mass is comprised in the range from about 0.05 to about 0.95 inclusive.

8. A bearing body, according to any one of claims 1 to 7, wherein said reduced permeability portion or portions extend axially for a length which is from about 0.4 up to one times the total axial length of the bearing.

9. A sintered body for a self lubricating bearing substantially as described herein with reference to Fig. 2 of the accompanying drawings.

10. A self lubricating bearing incorporating a bearing body as claimed in any one of claims 1 to 9.

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